Register Number: ……..

B.E. DEGREE EXAMINATIONS: MAY/JUNE 2013

Seventh Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

EIE 116 : Applied Soft Computing

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The number of hidden layers in a single-layer perceptron has
   a) 0 b) 1
   c) 2 d) 3
2. The Hopfield network is a
   a) Feedforward network b) Feedback network
   c) Feedforward-feedback network d) Multi-layer perceptron
3. A multilayer perceptron is trained using
   a) Hebbian learning b) Backpropagation algorithm
   c) Perceptron training d) Adaline learning algorithm
4. The commonly used architecture for control using neural networks is
   a) Multilayer prceptron b) Adaptive resonance theory
   c) Kohnen maps d) Hopfield network
5. If $\mu_A(x) = 0.5$ and $\mu_B(x) = 0.75$, then $\mu_{A \cap B}(x)$ is
   a) 1 b) 0.75
   c) 0 d) 0.5
6. If $\mu_A(x) = 0.75$ and $\mu_B(x) = 0.25$, then $\mu_{A \cup B}(x)$ is
   a) 0.25 b) 0.75
   c) 0 d) 1
7. The membership functions of input and output variables are available in the
   a) Fuzzifier b) Decision making knowledge
   c) Knowledge base d) Defuzzifier
8. The commonly used defuzzification method for a fuzzy logic controller is the
   a) Middle of the maximum method b) Centroid method
   c) Smallest of maximum method d) Bisector method

9. A genetic algorithm is a

a) Optimization technique
b) Neural network
c) Fuzzy Logic System
d) None of the above

10. The GA operators are

a) Crossover only
b) Crossover and mutation only
c) Mutation only
d) Crossover, mutation and selection

PART B (10 x 2 = 20 Marks)

11. Compare an artificial neuron with a biological neuron.
12. What is linear separability in an artificial neural network (ANN)?
13. What is direct-inverse control using ANN?
14. What is an adaptive neuro-controller?
15. With an example, show how a fuzzy set is different from a crisp set.
16. Give an example of a fuzzy relation.
17. What is meant by fuzzification?
18. Name any two defuzzification techniques with their mathematical relations.
19. What is a fuzzy neuron?
20. Draw the block diagram/ flow chart of Genetic Algorithm.

PART C (5 x 14 = 70 Marks)

21. a) Design a single layer perceptron for a two-input NOR gate using the perceptron training algorithm.

Input 1	Input 2	Output
0	0	1
0	1	0
1	0	0
1	1	0

(OR)

b) (i) Explain the Kohnen self-organizing neural network. (7)

(ii) Discuss the training and testing of this network. (7)

22. a) Explain any two schemes of controlling a system using ANN.

(OR)

b) Explain the identification and control of a dynamical system using ANN.

23. a) (i) Fuzzy set A = $0.2 * x$, Fuzzy set B = $1 - \frac{x}{x+1}$ where $x \in \{0,1,2,3,4,5\}$. (7)

Draw the membership functions of A, B, $A \cup B$, $A \cap B$ and $\overline{A}$.

(ii) Define the fuzzy sets for height, weight and age of EIE students in your class. For the fuzzy variable height choose fuzzy sets short, medium and tall. For the fuzzy variable weight choose fuzzy sets light, average and heavy. For fuzzy variable age choose fuzzy sets young, adult and old. Apply these to yourself to find (7)

(i) You are young, medium height and average weight.
(ii) You are not short or heavy or not old.

(OR)

b) (i) With neat diagrams, explain the operations on a fuzzy set with an example. (7)

(ii) Find the max-min and the max-product compositions for the fuzzy relations A and B. (7)

$$A = \begin{bmatrix} 0.4 & 0.7 \\ 0.2 & 0.3 \end{bmatrix} \text{ and } B = \begin{bmatrix} 0.8 & 0.4 \\ 0.1 & 0.6 \end{bmatrix}$$

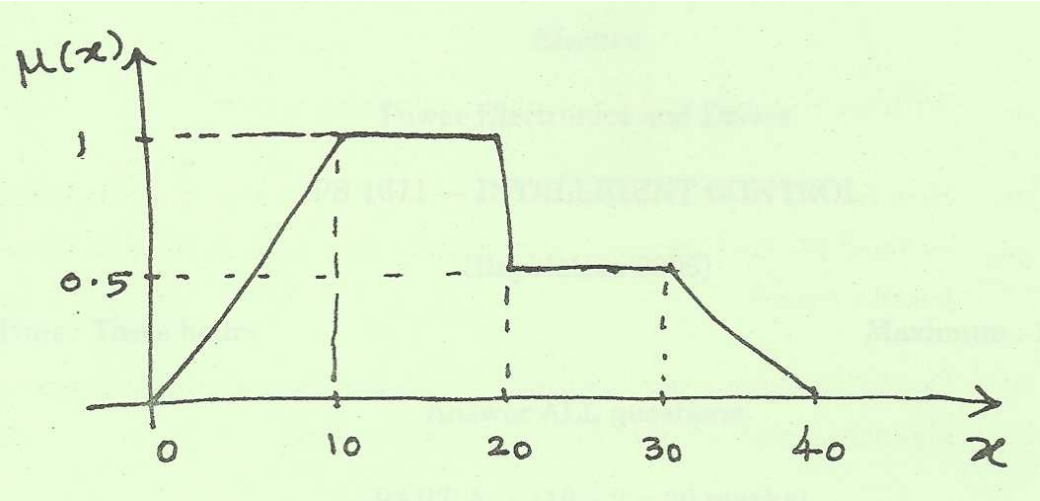
24. a) (i) With a neat block diagram, explain an adaptive fuzzy control system. (8)

(ii) Enumerate the design of a fuzzy controller of a process (6)

(OR)

b) (i) With a block diagram, explain the various blocks of a fuzzy logic controller. (8)

(ii) Calculate the crisp output for the membership function shown in the Figure 1 using (i) centre of gravity method, (ii) leftmost of maximum method and (iii) mean of maximum method. (6)



25. a) (i) With neat diagrams, explain the operation of a GA (9)

(ii) What are the GA operators? How are they chosen? (5)

(OR)

b) Write Notes on: (any two):

(i) Fuzzy neuron

(ii) Elements of evolutionary computation

(iii) Rule base of a fuzzy system using ANN.

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